## Evaluation the compressive and diametric tensile strength of nano and hybrid composites

Madam,

Over time several changes have been made in formulation to produce composite materials for adequate clinical success. The latest innovations are the development of dental composites based on nanotechnology.[1,2] So we decide to evaluate the physical properties Diametral Tensile Strength (DTS) and Compressive Strenghth (CS) of such new materials in this study. Four different light-activated resin composite materials of A2 shades (10 samples in each group) were used.

For compressive strength test, a nickel-chromium split mold with 6 mm depth and 3 mm diameter was used to prepare the cylindrical specimens. The compressive strength test was performed using a Universal Testing Machine at a crosshead speed of 1 mm/min. Specimens were positioned vertically on the testing machine base and subjected to compressive load until failure. For diametric tensile strength test, a nickel-chromium split mold with 3 mm in depth and 6 mm in diameter was used to prepare the cylindrical specimens. Other parts of the procedure were the same as compressive testing method except for the orientation of the samples in the instron testing machine.

Data was subjected to the parametric statistical analysis (ANOVA, *t* test) at significant level of $P = 0.05$.

No significant differences were found between the compressive strengths of the resin composites used in the study. This finding is in agreement with most studies [Table 1].[3]

Diametric tensile strength is a mechanical property used to understand the behavior of brittle materials when exposed to tensile stress. DTS is an acceptable and common test for dental composites.[4] The DTS mean values of the composites tested in the present study are in the DTS range of dental composites, 30-55 MPa.[5] Results of the present study showed that, some nanofilled composites may have lower DTS than the other composite resins [Table 2].

Another factor that influences DTS is filler particle size. Light-scattering within the composite is increased as the particle size of the fillers approaches the wavelength of the activating light. The light

**Table 1: Compressive strength values (MPa) of composite types**

| Composite types | Sample no. | Mean | Standard deviation | *P* value |
|---|---|---|---|---|
| Spectrum | 10 | 236.28 | 58.95 | 0.566 |
| Diafill | 10 | 249.86 | 43.88 | |
| NexComp | 10 | 266.77 | 51.86 | 0.219 |
| Synergy nano | 10 | 238.88 | 33.47 | |
| Hybrid | 20 | 243.06 | 51.06 | 0.588 |
| Nano | 20 | 251.32 | 44.36 | |

**Table 2: Diametric tensile strength values (MPa) of composite types**

| Composite types | Sample no. | Mean | Standard deviation | *P* value |
|---|---|---|---|---|
| Spectrum | 10 | 29.56 | 7.13 | 0.222 |
| Diafill | 10 | 32.74 | 3.51 | |
| NexComp | 10 | 26.23 | 4.75 | 0.007 |
| Synergy nano | 10 | 31.91 | 4.82 | |
| NexComp | 10 | 26.24 | 3.42 | 0.026 |
| Synergy nano | 10 | 31.91 | 4.83 | |
| Hybrid | 20 | 31.16 | 5.71 | |

scattering will reduce the amount of light transmitted through the composite.[6] Therefore, the hybrid composites (Diafill, Spectrum) and Synergy Nano composite showed the greatest DTS values, since they were less affected by light-scattering.[7] However, in this study results are different because Spectrum has large particle size and showed lower values of DTS. This could be due to a very high filler contents or large filler particle size that may interfere with light penetration during polymerization and influences the DTS of the material.

So Compressive strengths of various composites are about the same, but DTS of some nanofilled composites may be lower than the other nanofilled or hybrid composites.

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